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| IALA Guideline |

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Acceptance of VTS SYSTEMS

Edition 1.0

Document date

Revisions to this IALA Document are to be noted in the table prior to the issue of a revised document.

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# Preamble

At present, this document is a collection of information collected and processed starting at VTS-41 up to VTS-46 to be brought forward to the next working period.

**To be written:**

**Technology-dependent/sub-system testing guidelines**

1. Radar
2. AIS
3. Long-range sensors
4. EOS
5. (Radio) Communications
6. Environmental monitoring
7. Human / Machine interface
8. Data processing
9. Decision support
10. External information exchange
11. Radio Direction Finder

Template structure for each guideline:

1. INTRODUCTION

1.1. definition

1.2. References

2. AIMS AND OBJECTIVES

3. VERIFICATION AND VALIDATION METHODS

3.1. <Technology> Component verification

3.2. <Technology> Integration Verification

3.3. <Technology> Validation Process prior to installation

3.4. <Technology> Validation Process on site

# INTRODUCTION

This guideline presents a common source of information to assist in the operational and technical acceptance of VTS systems. While this guideline provides general information, for complex, sub-systems, a guideline may be available with more detailed information.

## OBJECTIVE of the Document

The objective of this document is to provide a framework for acceptance of a VTS System.

It recommends procedures and activities that should demonstrate that a VTS System is working according to the agreed specifications (verification) and is suitable for providing the intended VTS (validation).

As a result, there will be a common understanding between the Customer and the Supplier about the set requirements and the procedures that demonstrate compliance.

## definitions

ISO:9000-2005 - Quality Management Systems [4], sections §3.8.4 and §3.8.5, contain the following definitions:

**Verification**

*“Confirmation, through the provision of objective evidence , that specified requirements have been fulfilled”*

**Validation**

*“Confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled”*

Confirmation can comprise activities such as

* performing alternative calculations,
* comparing a new design specification with a similar proven design specification,
* undertaking tests and demonstrations, and
* reviewing documents prior to issue.

## References

|  |  |  |
| --- | --- | --- |
| [1] | IALA Recommendation V-119 | The Implementation of Vessel Traffic Services |
| [2] | IALA Recommendation V-128 | Preparation of Operational and Technical  Performance Requirements for VTS Systems |
| [3] | IALA Guideline 1111 | Preparation of Operational and Technical Performance Requirements for VTS Systems |
| [4] | ISO:9000-2005 | Quality Management Systems |
| [5] | ISO 15288:2008 | Systems and Software Engineering – System life cycle processes |
| [6] | INCOSE-TP-2003-002-03.2.2 | INCOSE Systems Engineering Handbook. A Guide for System Life Cycle Processes and Activities, Ver. 3.2.2 October 2011. |

# VERIFICATION AND VALIDATION PROCESS

The verification and validation (V&V) process is intended to demonstrate the compliance of the VTS system, prior to operation, to the contractual requirements through a structured model.

Guideline 1111 [3] already provides an introduction to the verification and validation process, the planning and the acceptance testing. This section further elaborates the different phases and methods to serve as a reference for the subsequent sections of the document.

## Management of the process

### Strategic Planning

It is recommended to include a strategic plan for the validation and verification in the contractual documents. The detail and level of effort should be in agreement with the system complexity and criticality.

The VTS system acceptance strategic plan could include how acceptance will be organized, including logistic arrangements, test contents and order, dependencies between process steps including key milestones and criteria for provisional (if applicable) and final VTS system acceptance.

### agreement on the requirement acceptance criteria

The basis for any acceptance process is an agreed set of requirements to be validated, the verification and validation methods, and an agreement on how to deal with non-compliance.

The requirements describe the operational scenarios, use cases, technical functions and performance of the system.

Requirements should:

* be uniquely identifiable
* have an acceptance criterion

A guidance principle for requirements is to describe them in a SMART (Specific, Measurable, Achievable, Relevant, Time bound) way.

However, this may not be possible for each and every requirement. For these specific requirements, Customer and Supplier should agree on the applicable acceptance criteria.

Description of SMART

### Resources?

It is recommended that customer personnel, if witnessing or taking part in the testing procedures, be appropriately trained in using the system.

## Process Model

The V-Model (figure 1) is a way to structure a system development and implementation process from definition to final acceptance.

The left-hand side of the figure represents the system realisation from requirements, through design, to implementation.

The right-hand side represents the corresponding verification and validation processes which are addressed in this document.

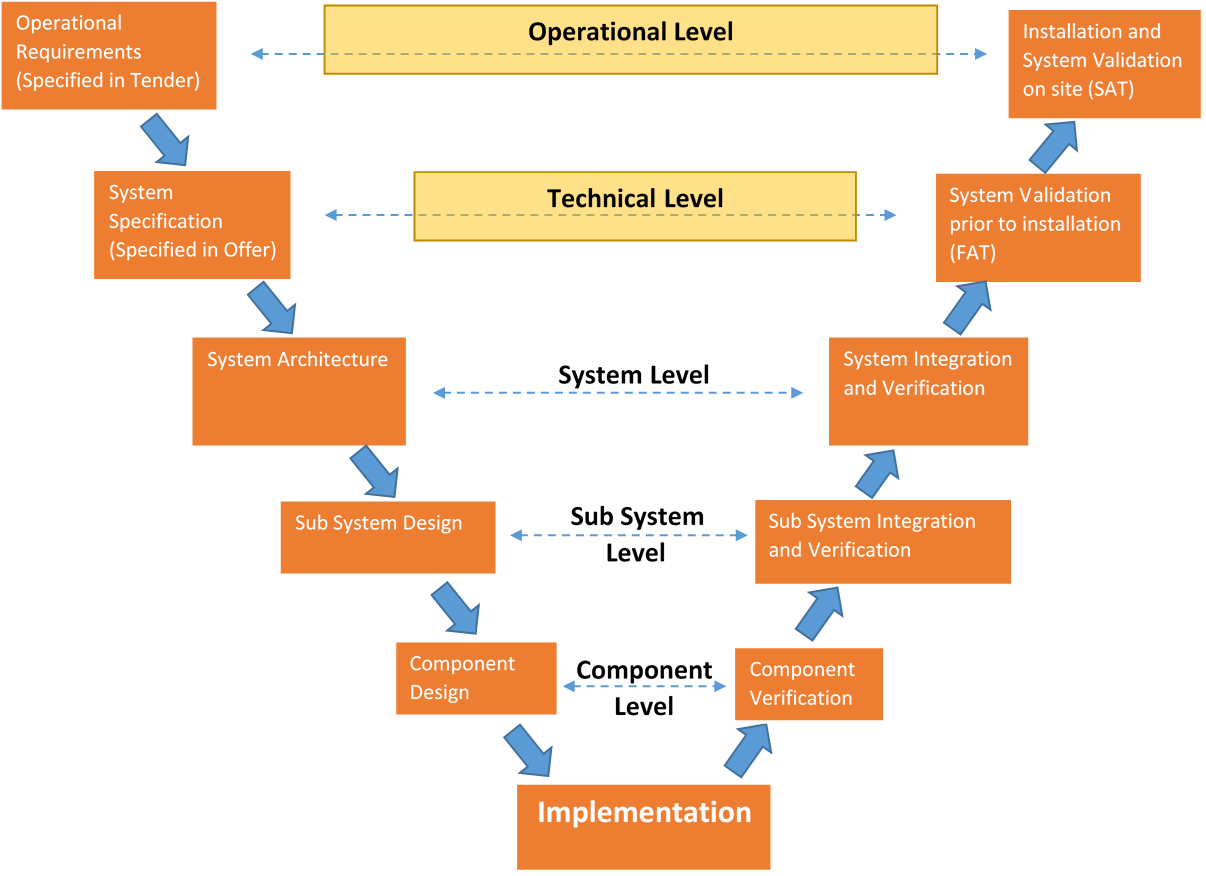


Figure 1: The V-Model

The following sections describe each of the verification and validation processes in more detail.

### Component verification

Goal:

* Evidence that sub-system component is compliant with the component design requirements.

The purpose of component verification is to verify that the specifications meet the requirements stated in the component design step. This is the lowest level verification step to ensure that there are no fundamental specific component issues when we move to integration. This is typically done in the form of compliance statements, also stating the used validation methods. However, the Customer may want to witness and/or approve part of the process, such as:

* Type approval of individual equipment, as required by regulation;
* Individual Hardware- and Software-specific verification tests;
* Verification of components in preparation for Factory Acceptance Tests;

Note that regulations may differ from country to country.

### sub-system integration and verification

Goal:

* Assemble components according to sub system design specifications
* Evidence that individual sub-systems are compliant with the functional requirements

The purpose of sub system verification is to verify the function and performance compliance of each sub system. The Supplier usually performs this phase before further system integration. The extent of verification is highly dependent on the sub-system complexity and customer specific requirement. Part of this process step is the verification of the interaction between system components.

### System Integration and verification

Goal:

* Assemble sub-systems in accordance with system architecture design
* Verify that the integrated system is performing according to system requirements

The extent of verification is highly dependent on the system complexity and customer specific requirement. Part of this process step is the verification of the interaction between sub-systems.

### Validation Process prior to installation and Factory Acceptance Test (FAT)

Goal:

* Prior to installation, the functions and performance of the system are verified to ensure they are in accordance to the contractual requirement. This verification is performed on the Supplier’s or component vendor’s premises.

The conduct of this phase is the Supplier responsibility and prepares for the Factory Acceptance Tests (FATs).

The Factory Acceptance Test demonstrates, prior to shipping and as far as agreed, that the system conforms to contractual specifications. It should be noted that the FAT will not fully demonstrate the specifications required, as there are limitations to testing in a factory environment.

Refer to Section 3.x.x for a more detailed description.

### Installation and On-site System Validation Process – Site Acceptance Test (SAT)

Goal:

* To install system and be ready for on-site testing.
* Provide objective evidence that the system operates according to the specified requirements, thereby achieving its intended use in its intended operational environment.

Prior to the installation, the Supplier and Customer should agree that preparatory work, such as civil works and structures, is satisfactorily completed.

Part of this process step is the visual inspection of the installation on site of the system.

After installation and setting-to-work, the SAT should take place. The purpose of the SAT is to confirm full operational and functional compliance.

Reasons for testing on site:

* Interaction with other systems
* Interaction with present infrastructure
* representative environment (e.g. geography)

Ideally, the SAT should not repeat the tests done at FAT.

Refer to Section 3.x.x for a more detailed description of the on-site acceptance tests.

## Verification and Validation Methods

The basic verification and validation methods, applicable to the VTS system or its different elements and relevant in the different phase of the V-model, are the following:

* Inspection (I): An examination of the item against applicable documentation to confirm compliance with requirements. Inspection is used to verify properties best determined by examination and observation (e.g. paint colour, weight, physical dimensions, etc.).
* Similarity (S): Similarity is most appropriate where a design is being modified or is very similar to an existing verified system. When verifying by similarity, a common scenario is to perform an analysis to ensure the design and operational environment is similar enough to claim similarity.
* Analysis (A): Use of analytical data or simulations under defined conditions to show theoretical compliance. Analysis (including simulation) is used where verifying to realistic conditions cannot be achieved or is not cost-effective and when such means establish that the appropriate requirement, specification, or derived requirement is met by the proposed solution.
* Demonstration (D): A qualitative exhibition of functional performance, usually accomplished with no or minimal instrumentation. Demonstration (a set of verification activities with system stimuli selected by the system developer) may be used to show that the system or subsystem response to stimuli is suitable. Demonstration may also be appropriate when requirements or specifications are given in statistical terms (e.g. mean time to repair, average power consumption, etc.).
* Test (T): An action by which the operability, supportability, or performance capability of an item is verified when subjected to controlled conditions that are real or simulated. These verifications often use special test equipment or instrumentation to obtain very accurate quantitative data for analysis.
* Operational Trial (O): A period of time by which the system performance and reliability has to be proven according to Operational Procedure and reliability requirement.
* Certification (C): Written assurance that the product has been developed and can perform its assigned functions in accordance with legal or industrial standards. The development reviews and verification results form the basis for certification; however, outside authorities, without direction as to how the requirements are to be verified, typically perform certification (e.g. CE certification, UL certification, etc.)

The verification and validation cost generally increase when going down through the methods listed above, but also provides increased confidence that the requirement is actually met. The methods therefore involve balancing the most cost-effective mix of adequate testing against minimizing the risk of not meeting a requirement. Inadequate verification postpones problems to the validation phase, where costs for implementing needed changes to remedy the possible non-conformance is typically much larger.

For the validation, it is not sufficient to indicate the validation method. It is also needed to document *how* the stakeholder requirements shall be validated, and which validation activities the customer shall witness. As an example, there is a big difference if a requirement shall be tested with targets of opportunity or if the customer presupposes calibrated and certified targets, as the latter is much more expensive in both cost and schedule.

### Establishment of Acceptance Test Plan (ATP)

Goals:

* Agreement on acceptance criteria
* Agreement on verification and validation methods
* Agreement on planning and major milestones (e.g. FAT & SAT)
* Take into consideration the logistical aspects (e.g. resources, possible dependencies, documentation, …)
* Address non-compliance

The Acceptance Test Plan (ATP) is a collection of tests, analysis, and acceptance criteria that allows demonstrating that the system met contractual requirements. It shall describe the Validation methods for each requirement and the process phase in which these tests or analysis shall be conducted.

The Supplier, in cooperation with the Customer, may be responsible for the creation of the ATP which should be agreed on prior to the commencement of the acceptance testing. The ATP scope shall cover the complete system that forms the overall deliverable.

For each stage of acceptance testing, the Supplier shall issue a test procedure based on the agreed acceptance methods and procedures captured in the ATP. Test procedures should demonstrate compliance to the contractual requirements.

This test procedure shall include requirements for any systems, tools, software or resources needed to enable validation of the system under test. It should also include an agreed test protocol which consist of a list of requirements and corresponding verification tests, with their measurements and expected results, to demonstrate compliance.

At each stage of acceptance, the test report should at least include:

* Tested requirement(s)
* Configuration details;
* Date of the test;
* Who performed the test;
* The outcome of the test such as pass/fail, measurements, or findings.

Upon successful completion of the acceptance activities, described in the ATP, the system is considered ready for operational use.

## Factory Acceptance

### Introduction

The Factory Acceptance Test (FAT) demonstrates that the system conforms to contractual specifications, as far as is possible and as far as agreed with the Customer. The FAT is the Supplier responsibility and the Customer may elect to attend or to be represented at the FAT. The FAT will normally include Functional and Performance testing to agreed procedures.

The main reasons for testing in factory are:

* The availability of specific and specialised equipment
* Tests can be executed in a controlled environment. Therefore, testing is
  + Easier
  + Quicker
  + More precise
  + Repeatable
* It may be possible to perform more complete testing
* It may be possible to do destructive testing
* Testing in factory is generally cheaper

Personnel conducting the test should be familiar with set-up and operation of the system in test. The Customer’s representative(s), if in attendance, should be appropriately qualified to accept the system and understand issues that may arise during the testing. Safety Instructions should be noted.

### Test Execution

The items to be tested include

* + Physical Configuration Audit
  + Inspection of workmanship and regulatory compliance
  + Functional test of the equipment
  + Parameter adaptation
  + Performance test of the equipment

The outcome of a FAT should be recorded in a test report or certificate. This may include

* References to project name, customer, software revisions, hardware revisions, parts and serial numbers etc.;
* List of instruments and their calibration status;
* Functional test results including verification of safety measures;
* Performance test results;
* Signatories.

After the FAT, the Supplier should ensure that any issues that arise are addressed.

## ON-Site AccePtance

### Introduction

On-site V&V should demonstrate the proper functioning of the VTS System after installation and addresses those requirements that can only be tested in the operational environment. It takes into account the outcome of the Factory Acceptance Test and demonstrates that the installed VTS System complies with the agreed requirements and applicable regulations. On-site V&V may include inspections, functional checks and performance measurements.

In general, on-site acceptance testing comprises VTS System and sub-systems using different technologies and competent persons for the respective technologies.

### Pre-conditions for site acceptance test

Before the start of on-site V&V, it is suggested to check the following:

* + Site access and physical security
  + Construction works
  + Facilities such as power supplies (grid / non-grid / backup) and environmental conditioning
  + Safety measures, such as proper grounding, fire- and lightning protection.
  + Ergonomics
  + Network connections, on-site and, if required, off-site

### Test Execution

Testing may comprise one or more sub-systems:

* + Physical Configuration Audits
  + Inspection of workmanship including regulatory compliance
  + Test of equipment and sub-system installation
  + Test of sub-system integration, including networking
  + Setting to work, parameter adaptations, and tuning
  + Functional tests
  + Performance tests

### OUTCOMES

The outcomes of a SAT should be recorded in a test report or certificate. These typically include:

* + References to project name, customer, software revisions, hardware revisions, parts and serial numbers etc.;
  + List of instruments and their calibration status;
  + Functional test results including verification of safety measures;
  + Performance test results;
  + Open issues and corrective actions; and
  + Signatures.

During the SAT, the Customer and the Supplier should discuss any open issues and agree on appropriate corrective actions to be taken towards acceptance.

### Formal registration, approval/non-approval of test outcomes

It is recommended to register the test outcomes for:

* + Each sub-system individually; and
  + The complete site as a whole.

Based on the completion and outcomes of on-site testing, the Customer and Supplier should agree when to start VTS System level V&V testing.

# VTS SYSTEM Verification and Validation

## Introduction

VTS System verification and validation is the highest level of the whole V&V process. After successful completion, the VTS System is demonstrated to comply with the set requirements and to be fit for operational use.

In general, only the identified system-level requirements need to be demonstrated during the system-level V&V. Sub-system- and equipment-level requirements are assumed to have been demonstrated during their respective SATs and FATs. The Customer and Supplier may agree, however, to have certain (critical) sub-system tests demonstrated again.

## Verification and validation of Functional and Performance Requirements

* It is recommended to base verification on measured performance data using real targets/objects. This involves the collection of appropriate reference data against which the performance can be evaluated.
* Measurements, made from a live situation, should be analyzed taking into account the influence from the environment, such as sea state and weather conditions. They may substantially impact system behavior.
* It may be necessary to simulate data and events to demonstrate system performance limits or unusual conditions.

## Verification Items

* The customer may verify that the following documents have been issued:
  + Equipment test reports and compliance certificates
  + Sub-system test- and calibration reports.
  + System documentation, such as design documents, operational- and maintenance manuals.
* Availability requirements are usually addressed by having fallback/mitigation functions and redundant configurations to ensure continued operation when equipment or even complete sub-systems fail. Simulated failures can be used to test these requirements.

## Validation Items

Validation items are largely defined by the specific sub-systems that make up the VTS system under test. In addition, there may be specific customer requirements.

Requirements that generally need to be validated at system-level are

* Availability and reliability.

Availability and, in particular, reliability could be demonstrated during an agreed defect liability period after completion of the VTS System V&V. During this period, in which the system is operational, no changes in configuration should be made, except to correct observed problems, and a record should be kept of any issues.

After the defect liability period is elapsed, Customer and Supplier should agree about final acceptance of the VTS System.

* Adequate coverage of the VTS area by sensors and communication means
* The quality of the traffic image

# VTS Sub-System Verification and Validation

## Radar Validation ANNEX

Be sure not to repeat descriptions from G1111

Address customer witnessing (or not) in general document

Define the term Contractual requirements relative to the V model

Mention quality assurance during production – on system level

Prior to SAT, the system shall be installed and set up in a state ready for operation.

Design verification and Type approvals …………………..

The purpose of this section is to support Competent and VTS authorities in the validation of radar performance and its contribution to the VTS traffic image (situational awareness) for:

* The overall Radar Service
* The individual Radar Sensor

This is typically performed by the combination of Design Verification, Type Approvals, Factory Acceptance Tests and Site Acceptance Tests where the FAT typically will focus on detailed functional tests and measurements of Technical Specifications (e.g. Transmitted power, pulse characteristics and antenna data) for the individual equipment.

The SAT shall demonstrate that the Radar Service complies with the Contractual requirements under operational conditions. This includes inspections, functional checks, measurements, and performance validation for the individual Radar Sensor as well at the overall Radar Service.

Also note that the installed radar performance should be assessed relative to that contracted and expected from site surveys. Some factors cannot be measured in absolute terms but require assessment by experienced and well educated technicians and/or operators.

## Communications ANNEX

### INTRODUCTION

Radio communication equipment is useful for VTS Authorities and as a reminder; G1111 has produced guidance for the installation of the VTS infrastructure.

This document seeks to verify and validate the requirements.

### AIMS AND OBJECTIVES

The objective of this document is to provide methods to VTS authorities in the verification and validation of radio communication equipment performance.

### VERIFICATION & VALIDATION

We have defined the verification and validation processes in the following sections under Elements Verifications, Integration Verification, Validation Process Prior to installation and Validation Process on site.

#### Elements Verifications

The elements to be verified and validate includes

* Radio Communications
* RDF
* AIS

#### Integration Verification

VTS communication equipment may be located at remote sites and hence there is a need to verify its integration to the operating system of the VTS Centre. The competent and VTS authorities have to verify the following:

* The VTS Centre is able to remotely control and monitor the radio sites
* The link between the VTS Centre and the remote radio sites is operational

#### Validation Process Prior to installation

Various aspects of the VTS site have to be taken into consideration to ensure that the site is suitable. The following validation processes are recommended:

At the moment, there is a list of items to check. In the next session, the processes will have to be defined.

* To check that the design of the system take into consideration the performance of the various components (e.g coaxial cables, antenna gain, SWR) for optimal performance.
* To carry out an Electro Magnetic Interference (EMI) test to ensure that there would not be unnecessary interference
* To ensure that the frequency is within the authorized limits by the local regulatory authority
* To conduct a spectrum analysis on the frequency to be used to ensure that its good
* Define the criterions for the calibration of the RDF (RDF)
* To check that the VHF Data Link has adequate slots for the additional loading (AIS)

#### Validation Process on site

The VTS site should meet the operational requirements of the VTS Centre and there is a need to validate its capabilities. The following processes are recommended for validation.

At the moment, there is a list of items to check. In the next session, the processes will have to be defined.

* To ensure each equipment/components are installed properly and operational
* To conduct coverage test to verify the coverage (e.g. DSC, VHF Comms, Ch 16, lost messages for AIS)
* To check that the radio parameters (e.g. transmit power, receiver sensitivity) is optimized for the coverage area
* To check that the communications is operational (e.g. VTS operator at VTS centre able to communicate with vessels)
* To ensure that there is adequate lightning protection for the system
* To check that the joints between equipment/components are properly insulated and waterproof
* To verify that the radios for the VTS centre are configured properly according to the assigned frequencies
* To ensure that there is adequate backup power supply for the system
* The recording and playback should be tested and verified to be working according to the requirements
* To verify that the list of alarms and triggers are functioning as per required by the VTS Centre
* To verify that the fastening device to secure the antennas are appropriate taking into consideration the environmental conditions (e.g. wind load).
* To verify that the backup and fail back arrangements are functional
* To verify that the criterions are fulfilled
* To check the accuracy (e.g. bearing accuracy should be as what was stated in the requirements) and reliability of the system in real conditions. (RDF)
* To verify that the RDF is able to detect and locate transmission in the required frequency range (RDF)
* To verify that the RDF is able to simultaneously or near simultaneously monitor the required number of channels. (RDF)

## AUTOMATIC IDENTIFICATION SYSTEM ANNEX

### INTRODUCTION

The purpose of this section is to support Competent and VTS authorities in the validating AIS performance, AIS service and its contribution to the VTS traffic image (situational awareness).

The operational requirements to validate are describe in G1111 (§3.3)

Note that the validation procedure as to be adapted to the contractual requirement and in particular depend from available Physical Equipment (AIS base station; AIS limited base station; AIS receiver; AIS repeater; AIS Aid to Navigation (AtoN)).

### VERIFICATION ITEMS

The Competent and VTS authorities may verify that the following documents have been issued:

* AIS equipment test sheet issued by the AIS equipment manufacturer.
* AIS equipment compliance certificate issued by the AIS manufacturer including international standard (XXXX) and national or reginal regulation (CE Certificate)
* An MMSI number attribution issued by the appropriate national authority (Radio Communications or Broadcast Authority in most countries). Note that when several AIS base stations cover a large VTS Area, each base station can be given the same virtual MMSI.
* License has been attributed for every AIS base station by the appropriate national authority (Radio Communications or Broadcast Authority in most countries).
* Every AIS base station has a MMSI (Maritime Mobile Service Identity).
* Configuration document stating at the minimum that:

The correct MMSI number has been configure for each AIS equipment

If there is two base stations in and AIS Cell 30NM x 30 NM, one of the AIS base stations within a cell is configured to transmit its Fixed Access TDMA (FATDMA) information on one of the AIS VHF frequencies and the other base station is configured to transmit its FATDMA information on the other AIS VHF frequency.

### VALIDATION ITEMS

|  |  |  |  |
| --- | --- | --- | --- |
| G1111 | Scope | Procedure | Expected Result |
| 3.5 Operational Requirement | Check the AIS Coverage: | Check AIS track position report and information on the traffic image.  A cooperative vessel, with a verified AIS | All vessels equipped with an AIS transponder within the expected coverage area are displayed.  Cooperative vessel is tracked in the complete coverage area.  Note that weather condition, AIS network overload or specific consideration may affect the coverage ref to G1111 §3.7 for more information |
| 3.6.1.1 Target Tracking | Check that Vessel Position Report are available for VTSO |  | AIS tracks are display in the traffic image at the correct position  AIS information including the ship’s identity, ship type, position, course and speed over ground, navigational status and other safety related information are available.  The portrayal of the AIS tracks is consistent with the information received from the vessel (label, heading, outline size, …) |
| 3.6.1.2 Aids to Navigation | Check that AIS AtoN Report are available for VTSO AIS |  | AIS AtoNs are display in the traffic image at the correct position.  AIS AtoNs information including identity, type and other transmitted information are available |
| 3.6.1.3 Voyage-Related Data | Check that voyage, ETA and cargo are available to VTSO  Voyage, ETA and cargo are part of the standard AIS transmissions at 6 minutes intervals or on request. | Due to the absence of any commonly agreed procedure to update this data, it may not be present, be outdated or simply incorrect.  Consequently, the verification of this information shall be done with a cooperative vessel for which |  |
| 3.6.2 Information Exchange between VTS and Mariner |  | Coopering Vessel equipped with AIS shall be identified prior to the test |  |
| 3.6.2.1 Text Messaging | Check that VTSO and Mariner can exchange text message | Broadcast a message to all vessels fitted with AIS.  Acknowledge through VHF the good reception of AIS message | Vessel officer confirm the reception of the AIS message on its will appear on the Minimum Keyboard Display (MKD) of the on board AIS system |
|  |  | Send a message to specific vessels fitted with AIS.  Acknowledge through VHF the good reception of AIS message | Vessel officer confirm the reception of the AIS message on its will appear on the Minimum Keyboard Display (MKD) of the on board AIS system |
|  |  | Request to the Vessel Officer to send an AIS message to VTS. (It may be necessary to communicate the VTS MMSI number to the Vessel Officer). | VTSO is notify that an AIS message is received and can read the send message. |
| 3.6.2.2 Binary Messaging | Verify that the relevant “global” or “regional” binary messaging can be exchanged with mariners |  |  |
| 3.6.2.3 Aids to Navigation | AIS base stations, as part of a VTS System, can be configured to broadcast synthetic and/or virtual aids to Navigation (AtoN). |  |  |
| 3.6.3 Assigned Mode | VTS may use the AIS Service capability to change the reporting mode (from autonomous to assigned mode, for example) of selected shipboard AIS units. |  |  |

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## RADIO COMMUNICATIONS ANNEX

The purpose of this section is to support Competent and VTS authorities in the validating of radio communications, its performance parameters and its contribution to the VTS traffic image (situational awareness) and in supporting safe navigation of the VTS area.

### requirements

In 1111, do not repeat, advise on the most important specifics, such s EMC, keep on high level

The operational requirements to validate are the following:

* Collect position, safety, and general information from shipboard personnel and remote sensing devices ;
* the radio infrastructure guarantee the coverage in line with the area (A1, A2, A3, or A4) ;
* enable voice communications, data services and potentially video applications ;
* the radio communications range should facilitate VTS ship communications before the ship enters a VTS area of responsibility ;
* provide facility to automatically record radio communications and play back.

The functional requirements to validate are the following:

* Shipborne equipment should meet the functional requirements of the relevant IMO performance standards and the ITU‐R Radio Regulations ;
* Shore based equipment should also conform to the appropriate local technical standards ;
* Routine calls using DSC can be initiated by the VTS in order to direct a VHF call to a specific vessel through MMSI based addressing ;
* Distress calls use DSC system
* Power supply :
  + Spare solutions for supplying power (diesel generators, batteries, solar panels, wind turbines)
  + uninterruptible power supplies
* Site selection:
  + electrical power
  + physical security of the site
  + housing and possible re-location with existing infrastructure
  + Optimization of the coverage
* Environmental conditions – Weather elements
  + Electronic devices must be adapted from weather conditions : temperature, humidity and wind
  + wind load on antennas
  + lightning protection
  + maintenance access
  + Build-up of ice should also be a consideration
* Interference
  + Healthy requirements
  + Frequency spectrum must be agreed with the national radio licensing authority
  + Equipment should be installed in accordance with manufactorer's instruction and monitored
* Interfacing / Network
  + Compatibility of equipments with systems
* Development and innovations
  + Network card should be implemented in transmitters
* Back-up radio equipment
  + Radio equipment should be duplicated : availability assessment
* Shore stations
  + Power must be checked on antenna
* Antenna:
  + The resistance of the tower must be taken in consideration in the choice of antenna (wind conditions, weight)
  + orientation of antenna
  + Antenna directivity diagram
* Rack

### Verification items

* Power supply
  + Power supply test sheet issued by the equipment manufacturer
  + Power supply compliance certificate issued by the AIS manufacturer including local standard.
* Site location
  + Avoid channel saturation by subdividing the VTS area
  + Evaluate the impacts on human beings.
* Interference
  + Certificate…
  + Check if there is no neighboorhood station that can interfere the signal
* Interfacing / Network
  + Check the possibility of linking the equipment to the VTS authority network
* Shore stations / Radio signal
  + Check the Frequency band : VHF, MHF…

### Validation items

* Power supply must be available as long as possible : need alternative solutions as as batteries
  + Check the electrical wiring
  + Check the voltage of each power supply in respect of local standards
  + Check the activation time of spare power supply if main power is interrupted
* Environmental conditions – Weather elements - Electronic devices must be adapted from weather conditions
  + temperature, humidity and wind must be checked on site
* Shore stations / Radio signal
  + Measurements
    - Tx frequency
    - Rx frequency
    - Transmitters – ratio directed power / reflected power
    - Transmitters – Demodulation
    - Transmitters – Distorsion
    - Receivers – Sensitivity for squelch on
    - Receivers – Sensitivity for squelch off
    - Receiver – Scope 50 % full scale
    - Receiver – Listening on receiver loud speaker
* Antenna
  + Adaptation measurement for each antenna
* Interference: Frequency spectrum must be agreed with the national radio licensing authority
  + Study by the radio authority to validate the agreement
  + Check the frequency spectrum with tools like spectrum analyzer
* Interference: other tests to measure the efficience of the signal
  + Decoupling measurements between antennas
  + Harmonics measurements
* Development and innovations
  + voip: test:
    - Latency
    - Jitter
    - Quality of Service QoS
* Rack
  + Racks must be located in protected housing where tests must be done:
    - Power supply
    - Ambiant temperature
    - Humidity

## DATA PROCESSING

The purpose of this section is to support Competent and VTS authorities in the validation of Data processing, its performance parameters and its contribution to the VTS traffic image (situational awareness).

The validation shall focus on Operational Requirements of a recognized up-to-date traffic image, rather than Technical Specifications, using the principles of target racking and data fusion. Additionally, it introduces the issues of managing various types of information required within and outside the VTS.

the trade-off between a higher target detection probability, a larger initiation delay or a larger false target rate,needs to be taken into account.

It is recommended that the VTS Authority should specify the Operational and associated Validation

Requirements rather than Technical Specifications of Data processing

The operational requirements may be determined by:

* the Tracking and Data Fusion of the VTS system;
* the Tracking and Data Fusion sections consider sensor data from various sources including:

 Radar sensors;

 Adjacent VTS area or other agency tracks;

 AIS and Satellite AIS;

 LRIT;

 Electro-Optical Systems (EOS);

* Extracted plots include the following attributes:

 Time of measurement;

 Measured position (Cartesian or polar) and positional uncertainty;

 Originating sensor

* In addition, the plots attributes include:

 Identity;

 Radial (Doppler) speed;

 Physical extent of the plot;

 Signal strength

* Determination of environmental capabilities and constraints;
* Determination of ; the required probability of target detection and minimum acceptable latency in weather and propagation conditions normal for the VTS area
* Target separation and positional accuracy
* Update rate
* The required positional accuracy of the track and other associated track information (identity, target type, COG, SOG, manoeuvre etc.).

### Recording, Archiving and Replay

* Technical acceptance of Recording, Archiving and Replay will typically consist of functional tests in combination with validation of archive capacity.

## VTS HUMAN / MACHINE INTERFACE ANNEX

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10.4.2 Environmental Information 99

10.4.3 Decision Support Presentation 99

10.4.4 Electro-Optical Sensor Data Display and Control 99

10.5 Functional Requirements 99

10.5.1 System Status and Control 99

## RADIO COMMUNICATIONS ANNEX

### Introduction

Radio communication equipment is typically integrated into VTS applications to provide the VTSO with a real-time assessment of the situation in the VTS area of responsibility as well as a means to deliver timely services to VTS participants. Information collected and disseminated via this equipment can assist in assembling the traffic image and in supporting safe navigation of the VTS area.

### Purpose and Objectives

The purpose of this section is to support Competent and VTS authorities in the validation of Radio Communication System performance, supporting the design of the Radio Communication System and its contribution to the VTS traffic image (situational awareness).

The objectives of this validation will be to ensure the VTS system fulfills the following radio communication related objectives:

* Conforms to relevant local and international standards;
* Achieves design, installation and maintenance requirements;
* Achieves required radio communications coverage;
* Achieves required recording and playback of data;
* Demonstrates and displays required system malfunctions, warnings, alarms and indications

### Standards and References

Standards and references as per G1111 and customer supplied.

### Design, Installation and Maintenance

To be detailed – using G1111 as basis.

### Radio Communications Coverage

Validation of Radio Communication equipment to guarantee required coverage should be based upon the following:

* Area A1 - Within range of VHF coast stations with continuous DSC (digital selection calling) alerting available (about 20-30 nautical miles);
* Area A2 - Beyond area A1, but within range of MF coastal stations with continuous DSC alerting available (about 100 nautical miles);
* Area A3 - Beyond the first two areas, but within coverage of geostationary maritime communication satellites (in practice this means INMARSAT). This covers the area between roughly 70°N and 70°S
* Area A4 - The remaining sea areas. The most important of these is the sea around the North Pole (the area around the South Pole is mostly land). Geostationary satellites, which are positioned above the equator, cannot reach this far.

### Recording and playback of data

Recording and replay of radio communications should be validated to ensure that all designated radios record data as per recording and replay guidelines in G1111 and customer requirements.

### System Malfunctions, Warnings, Alarms and Indications

From the system verification tables all radio communication system malfunctions, warnings, alarms and indications should be defined.

Where system malfunctions, warnings, alarms and indications can be raised via controlled means or by triggers of opportunity, these should be validated to ensure adequate performance.

## DECISION SUPPORT ANNEX

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11.2.2 References 102

11.3 Characteristics of Decision Support Tools 102

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11.4.5 Sailing Plan Compliance 104

11.4.6 Area related 104

11.4.7 Speed Limitations 104

11.4.8 Incident or Accident Management 104

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12.3 Characteristics of External Information Exchange in VTS 105

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12.4.2 Access to Information 107

12.4.3 Data Security and Confidentiality 107

12.4.4 Legal Limitations 107

12.4.5 Data Integrity 107

12.4.6 Data Models 108

12.4.7 Architecture of Sharing 108

12.4.8 Storage 108

12.4.9 Communication Links

1. G1111 reference Matrix

*Separate annexes may need to be developed for subsystems*

|  |  |  |  |
| --- | --- | --- | --- |
| G1111 | Scope | Procedure | Expected Result |
| Technical Requirements |  |  |  |
| Tender approval | Check if the tender comply with country law | Review the tender documents and ensure that it comply with law and regulations | the tender match with all documents |
| Contract approval | Check the contact validity | Verify compliance with contractual documents and include all SAT and FAT Procedures | Validated contract |
| Type approval | Check if the type of the sensors is comply with the tender and country law | Review the tender documents and ensure that the sensor comply with documents | All sensors match with the tender documents |
| Qualified Person | Find the trained and Qualified Person | Proceed the FAT & SAT by the Qualified Person | Test done |
| Software/Hardware Version/Model | Check HW/SW Version / Model | Compare with contractual documents |  |
| Specifications | Check technical characteristics of the equipment | Fulfillment of the minimum requirements |  |
| Fall back mode | Check Fall back mode |  |  |
| Availability | Check the redundancy that get the desired Availability | Ensure that the availability not less than the requirement | High Availability |
| Latency | Check latency | measure the time from a sensor first gathering data relating to a target, to the time the corresponding data is presented to the user | Acceptable Latency Level |
| Coverage | Check that the coverage meet the requirements | Check overlapping sensors coverage | Full coverage |
| Bit error rate BER | Check BER | Check that the BER is below the acceptable level | Low BER |
| Signal to Noise ratio SNR | Ensure that the measured SNR give the required quality of service QOS | measurement of the power of a return from a target vs. the local sensor noise around the location of the target | High SNR |
| Sensors correlation | Check the correlation between sensors | Ensure that the correlation is done between Sensors | done |
| Operational Requirements |  |  |  |
| Sensors Sensitivity | Check sensors sensitivity | Measure the minimum received signal from all sensors |  |
| Calibration of all sensors | Check the calibration procedures for all sensor | accurately calibrate various sensors to the common reference system | Calibration certificate issued |
| Reliability | Check Reliability | Check the maintenance Procedures and spare parts list |  |
| The probability of target detection | Check the target detection rate |  | there is a trade-off between a higher target detection probability, a larger initiation delay or a larger false target rate. |
| The probability of false alarm | Check the false alarm rate |  | there is a trade-off between a higher target detection probability, a larger initiation  delay or a larger false target rate. |
| Sensors Accuracy | Check that sensor measurements have accepted accuracy | estimate of a target position and speed vector, measurements |  |
| The time stamping | Check The time stamping | The time stamping of sensor data, accurately reflecting the time of observation and measurement, is essential to enable the correct and accurate traffic image to be established and maintained |  |
| Track Validation | Check the Track Validation | Tracks should be validated against the possibility that they are, or have become, false tracks. Assessment of track quality and erratic track update behaviour may be considered as techniques to provide validation. | operational requirements regarding the detection of small targets may result in an increase in the probability of false tracks. |
| Track Data Output | The output of track data to other VTS sub-systems such as the display of the established traffic image to the VTSO | Track information, which might be required for display to the VTSO, includes:   Current location;   Vessel Identity;   Speed and course over ground;   Track history;   Contributing sensors (and lack of updates i.e. coasting);   Associating plot data;   Destination and ETA;   Passage plan;   Cargo;   Crew and passenger details. |  |

Table 18‑1 provides a specification, validation and verification template for VTS systems following the structure of IALA guideline 1111 providing compliance matrix intended for use at time of proposal as well as verification and validation matrix intended to be filled out during acceptance tests of the delivered solution.

The VTS authority might adapt the table to the individual requirements whereas proponents offering VTS solution not in any way shall modify the tables by editing text, deleting or adding a line. Only the fields marked as SoC (Statement of Compliance) and Clarification shall be completed as part of the proposal work

For compliance statements there are 4 types of fields:

1. Heading: section heading, no responses required
2. Information: informative text to provide further clarification – no responses required
3. Implicit: A requirement which is further subdivided into “children requirements. All children requirements must be complied to, in order to fully comply to an implicit requirement. A “partially comply” can be responded if one or more children requirements are not compliant
4. Requirement: a mandatory requirement associated with a single “shall” statement

Requirements shall be answered with one and only one of the following text:

1. C: “Comply” - the requirement is fully met by the proposed system, with no need for modification (COTS).
2. WC: “Will Comply” the requirement is not currently met by a COTS system baseline SW/HW but will do so after development or modification.
3. WPC: “Will Partially Comply” - the requirement will partially do so after modification. The proponent must explain in detail the required modification(s), how it will improve the system and where it will meet and not meet the requirement.
4. PC: “Partially Comply” - The current COTS baseline does not fully meet the requirement. Clarification is required.
5. NC: “Not Compliant” - The current COTS baseline does not meet the requirement and cannot be migrated to the PC, WPC or WC state in the near future.

Verification and validation shall follow the requirements set by the VTS-authority using the following methods:

* *Inspection (I):* An examination of the item against applicable documentation to confirm compliance with requirements.
* *Similarity (S):* Similarity is most appropriate where a design is being modified or is very similar to an existing verified system.
* *Analysis (A):* Use of analytical data or simulations under defined conditions to show theoretical compliance.
* *Demonstration (D):* A qualitative exhibition of functional performance, usually accomplished with no or minimal instrumentation.
* *Test (T):* An action by which the operability, supportability, or performance capability of an item is verified when subjected to controlled conditions that are real or simulated.
* *Certification (C):* Written assurance that the product has been developed and can perform its assigned functions in accordance with legal or industrial standards. The development reviews and verification results form the basis for certification; however, outside authorities, without direction as to how the requirements are to be verified, typically perform certification(e.g. CE certification, UL certification, etc.)

Where

|  |  |  |  |
| --- | --- | --- | --- |
| G1111 | Scope | Procedure | Expected Result |
| Technical Requirements |  |  |  |
| Tender approval | Check if the tender comply with country law | Review the tender documents and ensure that it comply with law and regulations | the tender match with all documents |
| Contract approval | Check the contact validity | Verify compliance with contractual documents and include all SAT and FAT Procedures | Validated contract |
| Type approval | Check if the type of the sensors is comply with the tender and country law | Review the tender documents and ensure that the sensor comply with documents | All sensors match with the tender documents |
| Qualified Person | Find the trained and Qualified Person | Proceed the FAT & SAT by the Qualified Person | Test done |
| Software/Hardware Version/Model | Check HW/SW Version / Model | Compare with contractual documents |  |
| Specifications | Check technical characteristics of the equipment | Fulfillment of the minimum requirements |  |
| Fall back mode | Check Fall back mode |  |  |
| Availability | Check the redundancy that get the desired Availability | Ensure that the availability not less than the requirement | High Availability |
| Latency | Check latency | measure the time from a sensor first gathering data relating to a target, to the time the corresponding data is presented to the user | Acceptable Latency Level |
| Coverage | Check that the coverage meet the requirements | Check overlapping sensors coverage | Full coverage |
| Bit error rate BER | Check BER | Check that the BER is below the acceptable level | Low BER |
| Signal to Noise ratio SNR | Ensure that the measured SNR give the required quality of service QOS | measurement of the power of a return from a target vs. the local sensor noise around the location of the target | High SNR |
| Sensors correlation | Check the correlation between sensors | Ensure that the correlation is done between Sensors | done |
| Operational Requirements |  |  |  |
| Sensors Sensitivity | Check sensors sensitivity | Measure the minimum received signal from all sensors |  |
| Calibration of all sensors | Check the calibration procedures for all sensor | accurately calibrate various sensors to the common reference system | Calibration certificate issued |
| Reliability | Check Reliability | Check the maintenance Procedures and spare parts list |  |
| The probability of target detection | Check the target detection rate |  | there is a trade-off between a higher target detection probability, a larger initiation delay or a larger false target rate. |
| The probability of false alarm | Check the false alarm rate |  | there is a trade-off between a higher target detection probability, a larger initiation  delay or a larger false target rate. |
| Sensors Accuracy | Check that sensor measurements have accepted accuracy | estimate of a target position and speed vector, measurements |  |
| The time stamping | Check The time stamping | The time stamping of sensor data, accurately reflecting the time of observation and measurement, is essential to enable the correct and accurate traffic image to be established and maintained |  |
| Track Validation | Check the Track Validation | Tracks should be validated against the possibility that they are, or have become, false tracks. Assessment of track quality and erratic track update behaviour may be considered as techniques to provide validation. | operational requirements regarding the detection of small targets may result in an increase in the probability of false tracks. |
| Track Data Output | The output of track data to other VTS sub-systems such as the display of the established traffic image to the VTSO | Track information, which might be required for display to the VTSO, includes:   Current location;   Vessel Identity;   Speed and course over ground;   Track history;   Contributing sensors (and lack of updates i.e. coasting);   Associating plot data;   Destination and ETA;   Passage plan;   Cargo;   Crew and passenger details. |  |

Table 18‑1 also suggest methods and appropriate stage,

* during design,
* as part of Factory Acceptance Test ,
* as part of Site Acceptance T
* or as part of In Operation Test

|  |  |  |  |
| --- | --- | --- | --- |
| G1111 | Scope | Procedure | Expected Result |
| Technical Requirements |  |  |  |
| Tender approval | Check if the tender comply with country law | Review the tender documents and ensure that it comply with law and regulations | the tender match with all documents |
| Contract approval | Check the contact validity | Verify compliance with contractual documents and include all SAT and FAT Procedures | Validated contract |
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| Qualified Person | Find the trained and Qualified Person | Proceed the FAT & SAT by the Qualified Person | Test done |
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| Specifications | Check technical characteristics of the equipment | Fulfillment of the minimum requirements |  |
| Fall back mode | Check Fall back mode |  |  |
| Availability | Check the redundancy that get the desired Availability | Ensure that the availability not less than the requirement | High Availability |
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Table 18‑1 Specification, verification and validation template for VTS systems

| **Item** | Description | Requirements | G1111 Reference | Compliance Statement *(Contractual agreement - shall this be included?)* | | Verification and Validation of delivered solution | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SoC** | **Clarification** | **Test method** | **Milestone** | **Procedure** | **Expected results per contractual requirements** | **Result incl. reference to reporting & description of possible corrective actions** |
| 1 | **INTRODUCTION** | **Heading** |  | **N/A** |  |  |  |  |  |  |
| 1.1 | **Scope** | **Heading** |  | **N/A** |  |  |  |  |  |  |
|  | This document covers the technical requirements for the delivery and associated life cycle support of …… | Information |  |  |  |  |  |  |  |  |
| 1.3 | **Core Requirements** | **Heading** |  | **N/A** |  |  |  |  |  |  |
| 1.3 | **Operational Requirements** | **Heading** | **1.3** | **N/A** |  |  |  |  |  |  |
| 1.3.1 | The VTS area, (VTS sub-areas) (and sectors) are delineated …. | Information |  |  |  |  |  |  |  |  |
| 1.3.2 | The of services to be provided include (INS, TOS, NAS) | Information |  |  |  |  |  |  |  |  |
| 1.3.3 | Types and sizes of vessels expected to participate in the VTS include: | Information |  |  |  |  |  |  |  |  |
| 1.3.4 | Navigational Hazards and traffic patterns are described in ….. | Information |  |  |  |  |  |  |  |  |
| 1.3.5 | Human factors including health and safety issues include ….. | Information |  |  |  |  |  |  |  |  |
| 1.3.6 | Tasks to be performed by System users include…. | Information |  |  |  |  |  |  |  |  |
| 1.3.7 | Refer to ……. For operational procedures, staffing level and operating hours of the VTS | Information |  |  |  |  |  |  |  |  |
| 1.3.8 | Co-operation with external stakeholders will include ……. | Information |  |  |  |  |  |  |  |  |
| 1.3.9 | Refer to ….. for information about physical security of the VTS Centre and remote sites *(possible classified documentation)* | Information |  |  |  |  |  |  |  |  |
| 1.3.10 | Refer to ….. for information on Business continuity, availability, reliability and disaster recovery | Information |  |  |  |  |  |  |  |  |
| 1.3.11 | The Legal framework is described by ….. | Information |  |  |  |  |  |  |  |  |
| 1.3 | **Technical Implementation** | **Heading** | **1.3** | **N/A** |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| 1.4.1 | **Availability and Reliability** | **Heading** | **1.4.1** | **N/A** |  |  |  |  |  |  |
|  | Note that multiple means of communications and multiple sources of sensor information may result in reduced requirements for the availability of each item of equipment individually. | Information |  | N/A |  |  |  |  |  |  |
|  | Overall System Availability shall be XX.X % | Requirement |  |  |  | Analysis during design | FAT |  |  |  |
| Measurement | IOT |  |  |  |
|  | Individual sensor a… | Requirement |  |  |  |  |  |  |  |  |
|  | Individual sensor b… | Requirement |  |  |  |  |  |  |  |  |
|  | Communication …. | Requirement |  |  |  |  |  |  |  |  |
|  | Etc. | Requirement |  |  |  |  |  |  |  |  |
| 1.4.2 | **Recording, Archiving and Replay** | **Heading** | **1.4.2** | **N/A** |  |  |  |  |  |  |
| 1.4.2.1 | Stored and archived data shall include:   * ….. | Requirement |  |  |  |  |  |  |  |  |
| 1.4.2.1 | Storage capacity shall be for a minimum of \_\_ days | Requirement |  |  |  |  |  |  |  |  |
| 1.4.2.1 | Data shall be recorded automatically and be capable of replay without impact to on-going VTS operations. | Requirement |  |  |  |  |  |  |  |  |
|  | Information shall be synchronised of for replay | Requirement |  |  |  |  |  |  |  |  |
| 1.4.3 | Design, Installation & Maintenance | **Heading** | **1.4.3** |  |  |  |  |  |  |  |
| 1.4.3.1 | **Climatic Categories for outdoor installations** | **Heading** |  | **N/A** |  |  |  |  |  |  |
|  | The outdoor installations will be subject to  “Basic”, “Hot”, “Cold” “Severe Cold” /  “Coastal/Ocean”, “hot dry”, “hot humid” climate condition *(delete as appropriate)* | Information | 1.4.3.1 | N/A |  |  |  |  |  |  |
|  |  | Requirement |  |  |  |  |  |  |  |  |
| 1.4.3.2 | **Wind Considerations** | **Heading** | **1.4.3.2** | **N/A** |  |  |  |  |  |  |
|  |  | Information |  |  |  |  |  |  |  |  |
|  |  | Requirement |  |  |  |  |  |  |  |  |
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| 1.4.3.3 | **Special Considerations** | **Heading** | **1.4.3.2** | **N/A** |  |  |  |  |  |  |
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To be discuss if it is relevant to have compliance & Verification and Validation in separated rows – or make 2 tables – also should we make separate annexes for each type of subsystem.

### (Example Heading level 2)

Body text



1. Geographical range

Where:

Rg is the geographical range (nautical miles) (alternatively NM)

ho is the elevation of observer’s eye (metres) (alternatively m)

Hm is the elevation of the mark (metres) (alternatively m)

#### (Example heading level 3)

Body text.

1. Theory of Special Relativity

Where:

E is the kinetic energy (Joules) (alternatively J)

m is the mass (kilograms) (alternatively Kg)

c is the speed of light (metres/second) (alternatively m/s)

##### (Example heading level 4)

Body text.

# OVERVIEW (Example Heading level 1)[[1]](#footnote-1)

Body text. Bullets have only one sentence. Anything further needs to appear in the relevant 'bullet text' style.

* Bullet 1:
* Bullet 1:
* Bullet 1.

## TABLES

Body text

1. Example of a table with the significant information in the first column

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| Table heading | Table text |
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| Table heading | Table text |

1. Example of a table with the significant information in the first row[[2]](#footnote-2)

|  |  |  |
| --- | --- | --- |
| **Table heading** | Table heading | Table heading |
| Table text | Table text | Table text |
| Table text | Table text | Table text |
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| Table text | Table text | Table text |

1. Example of a table with coloured rows

|  |  |  |
| --- | --- | --- |
| Table heading | Table heading | Table heading |
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| Table text | Table text | Table text |
| Table text | Table text | Table text |
| Table text | Table text | Table text |
| Table text | Table text | Table text |
| Table text | Table text | Table text |

**Note:** Colours for text and cell shading need to be selected from the permitted palette (see ANNEX G)

# FIGURES



1. Example figure



1. Another example figure

# DEFINITIONS

The definition of terms used in this Guideline can be found in the International Dictionary of Marine Aids to Navigation (IALA Dictionary) at <http://www.iala-aism.org/wiki/dictionary.Acronyms>

# ACRONYMS

IMO International Maritime Organization (Acronym style)

# REFERENCES

1. Abcd
2. Efgh
4. EXAMPLE OF AN ANNEX – LANDSCAPE

| **Item** | Description | Requirements | G1111 Reference | Compliance Statement *(Contractual agreement - shall this be included?)* | | Verification and Validation of delivered solution | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SoC** | **Clarification** | **Test method** | **Milestone** | **Procedure** | **Expected results per contractual requirements** | **Result incl. reference to reporting & description of possible corrective actions** |
| 1 | **INTRODUCTION** | **Heading** |  | **N/A** |  |  |  |  |  |  |
| 1.1 | **Scope** | **Heading** |  | **N/A** |  |  |  |  |  |  |
|  | This document covers the technical requirements for the delivery and associated life cycle support of …… | Information |  |  |  |  |  |  |  |  |
| 1.3 | **Core Requirements** | **Heading** |  | **N/A** |  |  |  |  |  |  |
| 1.3 | **Operational Requirements** | **Heading** | **1.3** | **N/A** |  |  |  |  |  |  |
| 1.3.1 | The VTS area, (VTS sub-areas) (and sectors) are delineated …. | Information |  |  |  |  |  |  |  |  |
| 1.3.2 | The of services to be provided include (INS, TOS, NAS) | Information |  |  |  |  |  |  |  |  |
| 1.3.3 | Types and sizes of vessels expected to participate in the VTS include: | Information |  |  |  |  |  |  |  |  |
| 1.3.4 | Navigational Hazards and traffic patterns are described in ….. | Information |  |  |  |  |  |  |  |  |
| 1.3.5 | Human factors including health and safety issues include ….. | Information |  |  |  |  |  |  |  |  |
| 1.3.6 | Tasks to be performed by System users include…. | Information |  |  |  |  |  |  |  |  |
| 1.3.7 | Refer to ……. For operational procedures, staffing level and operating hours of the VTS | Information |  |  |  |  |  |  |  |  |
| 1.3.8 | Co-operation with external stakeholders will include ……. | Information |  |  |  |  |  |  |  |  |
| 1.3.9 | Refer to ….. for information about physical security of the VTS Centre and remote sites *(possible classified documentation)* | Information |  |  |  |  |  |  |  |  |
| 1.3.10 | Refer to ….. for information on Business continuity, availability, reliability and disaster recovery | Information |  |  |  |  |  |  |  |  |
| 1.3.11 | The Legal framework is described by ….. | Information |  |  |  |  |  |  |  |  |
| 1.3 | **Technical Implementation** | **Heading** | **1.3** | **N/A** |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| 1.4.1 | **Availability and Reliability** | **Heading** | **1.4.1** | **N/A** |  |  |  |  |  |  |
|  | Note that multiple means of communications and multiple sources of sensor information may result in reduced requirements for the availability of each item of equipment individually. | Information |  | N/A |  |  |  |  |  |  |
|  | Overall System Availability shall be XX.X % | Requirement |  |  |  | Analysis during design | FAT |  |  |  |
| Measurement | IOT |  |  |  |
|  | Individual sensor a… | Requirement |  |  |  |  |  |  |  |  |
|  | Individual sensor b… | Requirement |  |  |  |  |  |  |  |  |
|  | Communication …. | Requirement |  |  |  |  |  |  |  |  |
|  | Etc. | Requirement |  |  |  |  |  |  |  |  |
| 1.4.2 | **Recording, Archiving and Replay** | **Heading** | **1.4.2** | **N/A** |  |  |  |  |  |  |
| 1.4.2.1 | Stored and archived data shall include:   * ….. | Requirement |  |  |  |  |  |  |  |  |
| 1.4.2.1 | Storage capacity shall be for a minimum of \_\_ days | Requirement |  |  |  |  |  |  |  |  |
| 1.4.2.1 | Data shall be recorded automatically and be capable of replay without impact to on-going VTS operations. | Requirement |  |  |  |  |  |  |  |  |
|  | Information shall be synchronised of for replay | Requirement |  |  |  |  |  |  |  |  |
| 1.4.3 | Design, Installation & Maintenance | **Heading** | **1.4.3** |  |  |  |  |  |  |  |
| 1.4.3.1 | **Climatic Categories for outdoor installations** | **Heading** |  | **N/A** |  |  |  |  |  |  |
|  | The outdoor installations will be subject to  “Basic”, “Hot”, “Cold” “Severe Cold” /  “Coastal/Ocean”, “hot dry”, “hot humid” climate condition *(delete as appropriate)* | Information | 1.4.3.1 | N/A |  |  |  |  |  |  |
|  |  | Requirement |  |  |  |  |  |  |  |  |
| 1.4.3.2 | **Wind Considerations** | **Heading** | **1.4.3.2** | **N/A** |  |  |  |  |  |  |
|  |  | Information |  |  |  |  |  |  |  |  |
|  |  | Requirement |  |  |  |  |  |  |  |  |
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| 1.4.3.3 | **Special Considerations** | **Heading** | **1.4.3.2** | **N/A** |  |  |  |  |  |  |
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1. example of ANNEX heading level 1

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* 1. example of annex heading level 2

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* + 1. Example of annex heading level 3

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* + - 1. Example of Annex heading level 4

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1. Example table

| No | Title/Topic | IMO References | Requirements | Possible Audit Questions | Remarks |
| --- | --- | --- | --- | --- | --- |
| 1 | Table text | Table text | Table text | Table text | Table text |
| Table text | Table text |
| Table text | Table text |

1. EXAMPLE OF AN APPENDIX TITLE
2. APPENDIX HEADING 1

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* 1. APPENDIX HEADING 2

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* + 1. APPENDIX HEADING 3

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* + - 1. Appendix Heading 4

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1. (EXAMPLE ANNEX TITLE)
2. Introduction (Example Annex Heading 1)

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* 1. Example of ANNEX HEADING Level 2

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* + 1. Example of annex heading level 3

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* + - 1. Example of Annex heading level 4

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1. PERMITTED COLOUR PALETTE



The IALA colour palette is divided in 3 palettes of different level of hierarchy that has to be respected.

Corporate colours

IALA’s corporate colour palette is directly inspired from the colours in our logotype:

- dark blue

- white

- yellow

- gradient blue

**Primary and secondary colours**

The primary colours are to be applied in complement

with the corporate colours.

This second level of colours gives rhythm and helps

to segment our publications.

The secondary colours are used to highlight

information, titles in a minor proportion only.

**Note: Corporate colours are not shown**

Recommendations

Model Courses

Guidelines

1. Example footnote [↑](#footnote-ref-1)
2. Example of footnote [↑](#footnote-ref-2)